CLAIMS

What is claimed is:

1. A method of storing data relating to a plurality of geometric objects that represent interconnect lines in a multidimensional design layout of an integrated circuit, the method comprising:

defining a plurality of regions in the multidimensional layout, wherein at least a portion of said geometric objects in said multidimensional design layout represent diagonal interconnect lines, and wherein a diagonal interconnect line defines a line deposed in a direction other than zero or ninety degrees relative to the integrated circuit boundaries, and

creating a plurality of hierarchical data structures for a number of said regions, wherein each hierarchical data structure corresponds to a particular region and stores the data of the geometric objects within its particular region.

2. The method of claim 1, wherein the step of storing the data of the geometric objects within its particular region comprising the steps of:

generating segment data for each of said "n" sided geometric objects, said segment data specifying "n" number of sides and including "n" vertices for a corresponding geometric object;

generating a hierarchical tree, with k levels of nodes, to represent said "n" sided geometric objects, wherein each node is associated with one of said segment data, by:

selecting a discriminating node as a parent node for a corresponding level;

computing a discriminator dimension;

selecting one of said "n" vertices based on said discriminator dimension for said discriminating node for use as a discriminator key for each of said k levels; and

portioning nodes, not yet assigned to said hierarchical tree, into outside_child nodes and inside_child nodes based on a comparison between said discriminator key and segment data for a node under analysis and recursively portioning nodes into said outside_child nodes and said inside_child nodes for each of said k levels.

3. The method of claim 1, further comprising:

for each particular region that has a hierarchical data structure,

identifying geometric objects outside of that region that are needed for analyzing the geometric objects within the particular region; and

inserting data relating to the identified geometric objects into the hierarchical data structure for the particular region.

4. The method of claim 1, wherein a first geometric object crosses a region boundary between first and second regions, the method further comprising:

identifying a first portion of the first geometric object that is within the first region; and

inserting data relating to the first portion in the hierarchical data structure of the first region.

5. The method of claim 1 further comprising creating a non-hierarchical data structure to define the plurality of regions.

6. The method of claim 1, wherein creating the non-hierarchical data structure includes creating an array of data objects, wherein each particular data object represents one particular region.

7. The method of claim 6, further comprising linking the data object for each region to that region's hierarchical data structure.

8. The method of claim 1, further comprising adaptively determining the number of the regions based on the number of the geometric objects.

9. The method of claim 8, wherein the number of regions increases linearly with the number of geometric objects.

10. The method of claim 1, further comprising adaptively determining the number of the regions based on the dimensions of the interconnect lines.

11. The method of claim 1, wherein the hierarchical data structures comprise n-g trees.

12. The method of claim 1, further comprising performing a range

query on one of the hierarchical data structures to identify geometric objects that are within a halo distance of a particular geometric object.

13. A computer readable medium comprising a plurality of instructions for manipulating data relating to a plurality of geometric objects that represent interconnect lines in a multidimensional design layout of an integrated circuit, said instructions, when executed by a computer, cause the computer to perform the steps of:

defining a plurality of regions in the multidimensional layout, wherein at least a portion of said geometric objects in said multidimensional design layout represent diagonal interconnect lines, and wherein a diagonal interconnect line defines a line deposed in a direction other than zero or ninety degrees relative to the integrated circuit boundaries, and

creating a plurality of hierarchical data structures for a number of said regions, wherein each hierarchical data structure corresponds to a particular region and stores the data of the geometric objects within its particular region.

14. The computer readable medium of claim 13, wherein the step of storing the data of the geometric objects within its particular region comprising the steps of:

generating segment data for each of said "n" sided geometric objects, said segment data specifying "n" number of sides and including "n" vertices for a corresponding geometric object;

generating a hierarchical tree, with k levels of nodes, to represent said "n" sided geometric objects, wherein each node is associated with one of said

segment data, by:

selecting a discriminating node as a parent node for a corresponding level;

computing a discriminator dimension;

selecting one of said "n" vertices based on said discriminator dimension for said discriminating node for use as a discriminator key for each of said k levels; and

portioning nodes, not yet assigned to said hierarchical tree, into outside_child nodes and inside_child nodes based on a comparison between said discriminator key and segment data for a node under analysis and recursively portioning nodes into said outside_child nodes and said inside_child nodes for each of said k levels.

15. The computer readable medium of claim 13, further comprising:

for each particular region that has a hierarchical data structure,

identifying geometric objects outside of that region that are needed for analyzing the geometric objects within the particular region; and

inserting data relating to the identified geometric objects into the hierarchical data structure for the particular region.

16. The computer readable medium of claim 13, wherein a first geometric object crosses a region boundary between first and second regions, the method further comprising:

identifying a first portion of the first geometric object that is within the first region; and

inserting data relating to the first portion in the hierarchical data structure of the first region.

17. The computer readable medium of claim 13 further comprising creating a non-hierarchical data structure to define the plurality of regions.

18. The computer readable medium of claim 13, wherein creating the non-hierarchical data structure includes creating an array of data objects, wherein each particular data object represents one particular region.

19. The computer readable medium of claim 18, further comprising linking the data object for each region to that region's hierarchical data structure.

20. The computer readable medium of claim 13, further comprising adaptively determining the number of the regions based on the number of the geometric objects.

21. The computer readable medium of claim 20, wherein the number of regions increases linearly with the number of geometric objects.

22. The computer readable medium of claim 13, further comprising adaptively determining the number of the regions based on the dimensions of the interconnect lines.

23. The computer readable medium of claim 13, wherein the

hierarchical data structures comprise n-g trees.

24. The computer readable medium of claim 13, further comprising performing a range query on one of the hierarchical data structures to identify geometric objects that are within a halo distance of a particular geometric object.